It is important to notice that the author accepts the types of the international cloud atlas and arranges his various forms as subforms of these types. There is, however, one exception. Mr. Clayden does not admit the nimbus cloud as a special type, but puts it under the type stratus. He employs nimbus as an adjective indicating that rain is falling from a cloud. We cannot agree with this plan. Every form of cloud can be transformed into another. It is, indeed, well known that the true typical forms are rare, the majority of clouds being intermediate forms. Of course, it often happens that stratus cloud is transformed to nimbus. The farmer in Sweden says, "if the fog is falling the weather will be fine, if the fog is lifting it comes back as rain." It is really the case that in certain weather conditions the fog follows the upward motion of the air; in the rising air the temperature falls, condensation goes on, and the light fog is transformed to a dense nimbus with rain. Nevertheless, there is a vast difference between the fog formed on or near the ground and the true canopy of nimbus cloud rushing forward beneath a layer of alto-stratus in the front of a storm. But here, as always, one form does sometimes pass into another. The alto-stratus does also sometimes sink down and become transformed into nimbus. We know that during summer all low clouds, as a rule, assume more or less the cumulus form. Thus we cannot say that a stratus or an alto-stratus is a nimbus more than that a stratus or a nimbus is a cumulus.

It is not possible to give in this short notice a description of the different forms presented in this book. We must also abstain from an exposition of the author's views regarding the causes which produce the different cloud forms. These views are in most cases highly probable, and in all cases useful hints are given for further investigations. Our purpose now is only to direct the attention of our fellow-students of clouds to a work of the greatest value, which should be studied with the greatest care. No one who desires to study the transformations of clouds or the relation of cloud forms to weather can neglect to consider the valuable results and ideas put forward by Mr. Clayden.

Of course, it is not possible for an international committee or conference to establish a very detailed classification of clouds, but we think it would be very useful if the author would provide the plates and short descriptions as a small atlas for use in observatories and for specialists.

H. HILDEBRAND HILDEBRANDSSON.

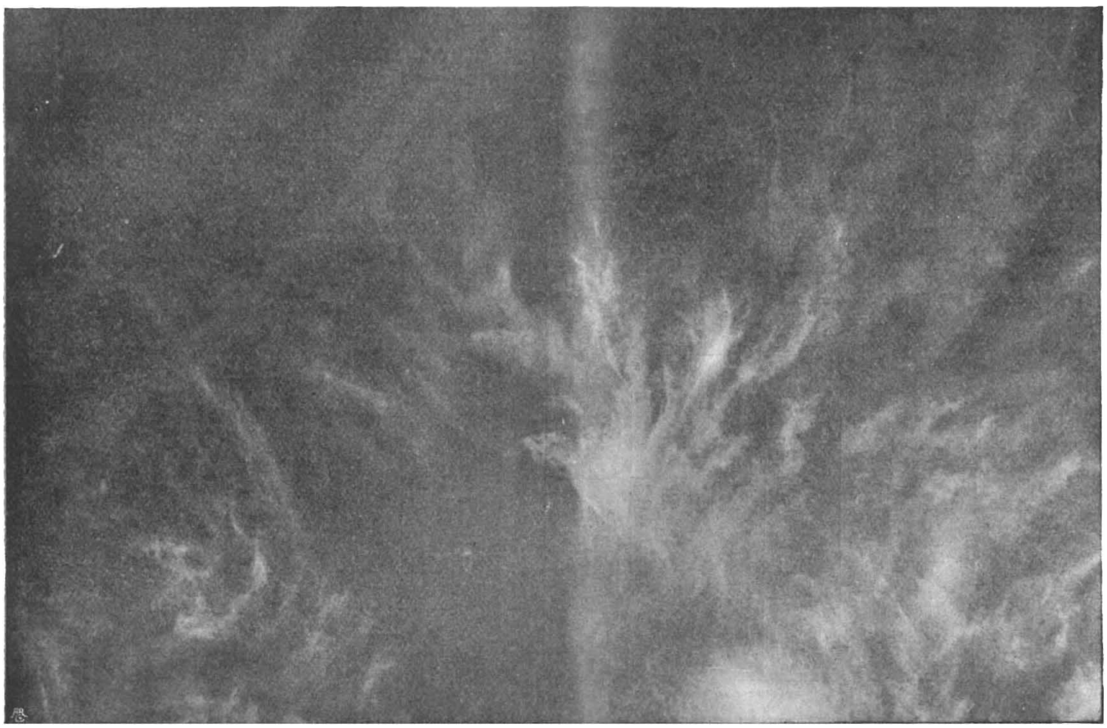

FIG. 2.—High Cirrus (*Cirrus Excelsus.*) From "Cloud Studies."

## TRANSPACIFIC LONGITUDES.

DURING the year 1903 Canada extended the longitude work, carried from Greenwich to Vancouver, across the Pacific to Australia and New Zealand. This was made possible by the completion of the British Pacific Cable—the All Red Line—in the autumn of 1902. The sections of the cable are:—

| | Nautical miles |
|---|---|
| Vancouver to Fanning Island... ... ... | 3654 |
| Fanning to Suva, Fiji ... ... ... ... | 2181 |
| Suva to Norfolk Island... ... ... ... | 1019 |
| Norfolk to Southport, Queensland ... ... | 906 |
| Southport to Doubtless Bay, New Zealand... | 513 |

The observers (Dr. Otto Klotz and F. W. O. Werry) were provided with practically identical instruments, the principal ones being the two Cooke transits, of 3 inches clear aperture, and of about 36 inches focal length. Cement or brick piers were built at every station. The observers occupied alternate stations across the Pacific, and as the number of stations is odd, Southport and Doubtless Bay are free from the personal equation, without a direct determination of the latter, although the personal equation was determined. Mr. Werry occupied Fanning and Norfolk,

the writer the other stations, including Sydney, Brisbane, and Wellington for personal equation. At Southport connection was made with the observatories at Sydney and Brisbane, and from Doubtless Bay with Wellington.

It was on September 29, 1903, that the first mutual observations and clock exchange were had with Sydney, and so this night may be considered as the one when for the first time longitude from the west clasped hands with longitude from the east, and the first astronomical girdle of the world was completed.

In making the comparison at Sydney between the longitude brought from the east with that from the west, I have used the value of Prof. Albrecht for the arc Greenwich-Potsdam 0h. 52m. 16·051s., and for the arcs from Potsdam to Madras, *viâ* Teherân, Bushire, Karachi, Bombay, and Bolaram, those of Major Burrard, giving for the longitude of Madras 5h. 20m. 59·235s.

As there has been no re-determination of the various arcs from Madras to Australia, I have adopted the values given in the Australian report of Ellery, Todd and Russell.

Applying these latter to the longitude of Madras, we get for the longitude of Sydney

| | h. m. s. | s |
|---|---|---|
| | 10 04 49 ... | 0·355±0·088 |
| The Canadian value is | 10 04 49 ... | 0·287±0·058 |
| Difference ... ... ... ... ... | | 0·068 |

equivalent for the latitude of Sydney to 84 feet. The 1886 value for Sydney is 10h. 04m. 49·54s.

The final values of the Canadian determinations are:—

*Final Longitude Values.*

| Station | Longitude | | | |
|---|---|---|---|---|
| | Time | Prob. error | Arc | Prob. error |
| | h. m. s. | s. | ° ′ ″ | ″ |
| Vancouver . . | 8 12 28·368 W. | ±0·050 | 123 07 05·520 | ±0·75 |
| Fanning . . . | 10 37 33·774 W. | ±0·054 | 159 23 26·610 | ±0·81 |
| Suva. . . . . | 11 53 42·389 E. | ±0·055 | 178 25 35·835 | ±0·82 |
| Norfolk . . . | 11 11 41·146 E. | ±0·056 | 167 55 17·190 | ±0·84 |
| Southport . . . | 10 13 39·782 E. | ±0·056 | 153 24 56·730 | ±0·84 |
| Sydney. . . . | 10 04 49·287 E. | ±0·058 | 151 12 19·305 | ±0·87 |
| Brisbane . . . | 10 12 06·044 E. | ±0·073 | 153 01 30·660 | ±1·09 |
| Doubtless Bay . | 11 33 56·146 E. | ±0·060 | 173 29 02·190 | ±0·90 |
| Wellington . . | 11 39 05·087 E. | ±0·075 | 174 46 16·305 | ±1·12 |

OTTO KLOTZ.

Ottawa, December 30, 1905.

## THE KANGRA EARTHQUAKE OF APRIL 4, 1905.

AFTER a lapse of only eight years since the great earthquake of 1897, India suffered another calamity of the same nature on April 4, 1905, less in violence and extent, but more calamitous in its results, for it claimed a death-roll of 20,000 souls. An interesting preliminary account of this earthquake, by Mr. C. S. Middlemiss, appears in the concluding part of vol. xxxii. of the *Records of the Geological Survey of India,* where the total area over which the shock was felt is estimated at about 1,625,000 square miles, as against 1,750,000 in 1897. The area over which the shock was destructive is smaller in proportion than these figures would suggest, for the isoseist corresponding to 10 degrees of the Rossi-Forel scale includes only 200 square miles, and that corresponding to 8 degrees of the same scale 2150 square miles, as against 300 and 145,000 in 1897. In comparing these figures an allowance must be made for the personal equation, and it seems that, if Mr. Middlemiss's standard had been adopted in 1897, the former of these figures would have been considerably increased and the latter somewhat reduced.

There were two centres of great violence, one near Kangra and Dharmsala, where the tenth degree of the Rossi-Forel scale was surpassed, the other in the Dehra Dun, where the ninth degree was not reached. Between these two the violence was much less, and Mr. Middlemiss points out that the two districts of greatest destruction lie, each, in an embayment of the course of the great boundary fault of the Himalayas; they are the only two irregularities in the generally even sweep of the boundary of the Tertiaries of the sub-Himalayan tract, and as the general effect of the Tertiary, and post-Tertiary, folding and fold-faulting has been to obliterate irregularities in the outline of the mountain-foot, it is natural to suppose that any marked irregularities still left may be in a peculiar state of strain, especially liable to give rise to geotectonic movements. Those which took place on April 4 last seem to have exhausted themselves

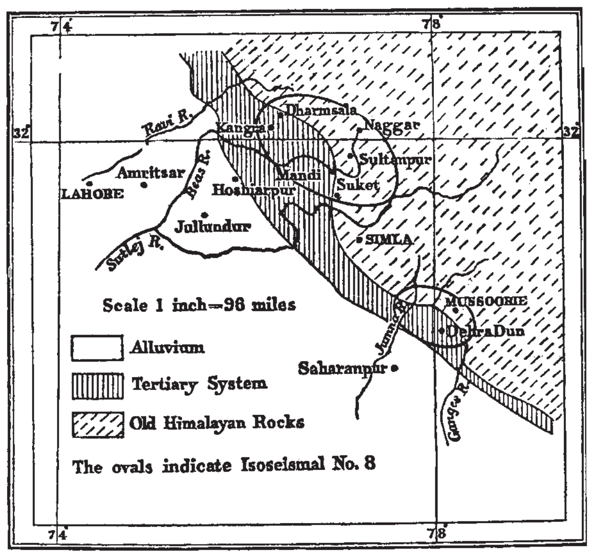


FIG. 1.—Origin of the Kangra earthquake of April 4, 1905.

underground, for no surface faults or changes of level were detected.

The nature of the shock seems to have differed from that of 1897, when all accounts agreed in describing it as simple, with only one marked maximum of violence. In 1904 there were, both in the Kangra and Dehra Dun districts, two or three distinct shocks, and we may mention that this is reflected in the long-distance records of the shocks, which indicate at least two distinct impulses, following each other at an interval of a couple of minutes, whereas in 1897 there was no indication of more than a single impulse. The violence of the shock at its greatest seems to have been a little less than in 1897; at Kangra Mr. Middlemiss's observations give the acceleration of wave particle as about 13 feet per second per second, the amplitude as 9.75 inches, and the period as 1.57 seconds. The time of origin, as deduced from local observations, is said to have been 6h. 9m. 0s. Madras time, within a second or two of error; the rate of propagation was 1.95 to 1.98 miles per second as between the origin and the seismograph stations at Bombay, Calcutta, and Kodaikanal, but it must be